

CLAIMS

1. Device for mini-invasive ultrasound treatment of an object, wherein at least one therapeutic ultrasound transducer (2) is arranged for treatment of the object (5) by generating an ultrasonic field (3), the temperature focus (F) of which is located in the object (5) for heating thereof; wherein the therapeutic ultrasound transducer (2) comprises a probe (10) adapted to be introduced into the body towards the object (5) to be treated and comprises a front portion (10a) adapted to be located at, against or in the object (5); and wherein said probe (10) comprises at least one transmitter element (11) for generating said ultrasonic field (3), **characterized in** that said transmitter element (11) is arranged in a rear portion (10b) behind the front portion (10a) of the probe (10), and in that said front portion (10a) is configured to be thermally insulating, whereby the transmitter element (11) does not heat or substantially not heat the front portion (10a) during operation.
2. Device according to claim 1, **characterized in** that the front portion (10a) of the probe (10) comprises a focussing device (13) for focussing the ultrasonic field (3) generated by the transmitter element (11).
3. Device according to claim 2, **characterized in** that the distance (A) between the transmitter element (11) and the focussing device (13) for focussing the ultrasonic field (3) in temperature focus (F) is in the range of 0,5 – 20 centimeters.
4. Device according to claim 3, **characterized in** that the distance (A) between the transmitter element (11) and the focussing device (13) for focussing the ultrasonic field (3) in temperature focus (F) is in the range of 1 - 18 centimeters.
5. Device according to any of the claims 2 – 4, **characterized in** that the probe (10), in a space (10c) between the transmitter element (11) and the focussing device (13) for focussing the ultrasonic field (3) in the temperature focus (F), is

configured and/or comprises a material such that only small power losses in the ultrasonic field (3) is obtained therein.

6. Device according to any of the claims 2 – 5, **characterized in** that the probe
5 (10), in a space (10c) between the transmitter element (11) and the focussing device (13) for focussing the ultrasonic field (3) in the temperature focus (F), comprises a material adapted to exert a focussing effect on the ultrasonic field (3) together with the focussing device (13).
- 10 7. Device according to any preceding claim, **characterized in** that an optical navigation device (20) comprises at least one diagnostic camera (21) arranged to generate at least one image of the anatomical structure (23) of the treatment area (22) within which the object (5) to be treated is located.
- 15 8. Device according to claim 7, **characterized in** that the diagnostic camera (21) is an X-ray camera (25).
9. Device according to claim 8, **characterized in** that the X-ray camera (25) comprises a positioning device (26) with markers (27) which are intended to
20 determine the position of the anatomical structure (23) displayed in a monitor (24) and present at the patient's (4) disc (5) to be treated.
10. Device according to claim 9, **characterized in** that the monitor (24) is arranged to display two X-ray photographs of said anatomical structure (23) taken with
25 the X-ray camera (25) from two different locations.
11. Device according to claim 7, **characterized in** that the diagnostic camera (21) is a computerized tomography (CT) scanner which is arranged to produce images of the anatomical structure (23) at the patient's (4) object (5) to be treated, which
30 images being processed in a computer program (software) for obtaining a 3D-

image in a monitor (24).

12. Device according to claim 7, **characterized in** that the diagnostic camera (21) is an X-ray camera or a MRI scanner which is arranged to produce images of the anatomical structure (23) at the patient's (4) object (5) to be treated, which images being processed in a computer program (software) for obtaining a 3D-image in a monitor (24).
13. Device according to any of claims 7 - 12, **characterized in** that that the optical navigating device (20) further comprises at least one signal receiving or signal sending unit (32) which is intended to receive signals from and/or send signals to position transmitters (31, 7) on
- a) a reference device (28) which has a set position relative to the object (5) and
 - b) the therapeutic ultrasound transducer (2) such that the position thereof relative to said treatment area (22) can be determined.
14. Device according to claim 13, **characterized in** that the signal receiving or signal sending unit (32) is arranged to receive or send signals in the form of infrared light or visible light or radio frequency electromagnetic waves or acoustic waves and that said position transmitters (7, 31) are arranged to send or receive signals in the form of infrared light or visible light or radio frequency electromagnetic waves or acoustic waves.
15. Device according to claim 13 or 14, **characterized in** that the reference device (28) is attached to a vertebra (29) in the patient's vertebral column, preferably to the spinal process (30) of said vertebra (29).
16. Device according to any of claim 13 – 15, **characterized in** that the reference device (28) comprises position transmitters (31) consisting of metallic balls, preferably tantalum balls.

17. Device according to claim 16, **characterized in** that the signal receiving or signal sending unit (32) of the optical navigating device (20) is at least one X-ray device.
- 5 18. Device according to any of claim 7 - 17, **characterized in** that that a tube (18) with an associated inner portion is insertable towards the object (5) to be treated and that said inner portion is intended to be replaced by the therapeutic ultrasound transducer (2).
- 10 19. Device according to claim 18, **characterized in** that that said tube (18) is navigatable by means of the optical navigating device (20) through the skin of the patient (4) and brought into contact with the object (5) to be treated.
- 15 20. Device according to any preceding claim, **characterized in** that the temperature in the temperature focus (F) of the therapeutic ultrasound transducer (2) exceeds 45°C.
- 20 21. Device according to any preceding claim, **characterized in** that a calibrating device (37) is arranged for calibrating the power emitted by the therapeutic ultrasound transducer (2) in the temperature focus (F) of said therapeutic ultrasound transducer (2) and/or the position of said temperature focus (F) relative to the transmitter element (11) of the therapeutic ultrasound transducer (2).
- 25 22. Device according to claim 21, **characterized in** that the calibrating device (37) is arranged to measure the emitted power by means of the echo of an ultrasound transmitter.
23. Device according to claim 22, **characterized in** that the calibrating device (37) is arranged to measure the echo from the therapeutic ultrasound transducer (2).

24. Device according to any preceding claim, **characterized in** that the probe (10) is provided with a cooling device comprising channels conducting cooling liquid around the tip of the probe (10), which tip is provided with a membrane.
- 5 25. Device according to any preceding claim, **characterized in** that the device is arranged for mini-invasive ultrasound treatment of an object (5) in the form of nucleus pulposus (6) in the patient's (4) disc.
- 10 26. Device according to claim 25, **characterized in** that the therapeutic ultrasound transducer (2) is arranged to be inserted through the patient's (4) skin through a cut therein or by means of a cannula and brought into contact with the disc which annulus fibrosus (8) is to be treated.
- 15 27. Device according to any of the claims 1 – 24, **characterized in** that it is arranged for mini-invasive ultrasound treatment of objects (5) in the form of ligaments in shoulders or knees.
- 20 28. Device according to any of the preceding claims, **characterized in** that electronics is located in or attached to the rear portion (10b) of the probe (10b) and arranged on the outside of the patient during treatment.
- 25 29. Use of a device according to any of the preceding claims, **characterized in** that it is used in methods for treatment of an object (5) in a patient's (4) body, such as for treatment of nucleus pulposus (6) in discs or ligaments in for example shoulders or knees.